

Challenges in identifying behavioural markers of bipolar disorder through objective smartphone data

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The study by Faurholt-Jepsen and colleagues¹ aimed to distinguish mood states in patients with bipolar disorder (BD) from healthy controls using objective smartphone data. Given the hallmark behavioural shifts associated with BD episodes, the prospect of identifying behavioural markers of risk has real potential for impactful interventions. The identification of behavioural markers of BD has been hampered by the inability to track relevant behaviours in real time, forcing studies to measure behaviours retrospectively, or prospectively, but during infrequent time points. An additional challenge has been making remote time behavioural data accessible to clinicians in an efficient and cost-effective way. Given the widespread use of mobile phones and expected rise by the end of the decade², the study by Faurholt-Jepsen and colleagues, and their prior complimentary work,³ is commended for establishing the initial feasibility of an easy to implement approach towards capturing behavioural changes in BD. Strengths of this study include its prospective nature and measurement of mood states and smartphone measures across several time points. Further, the authors included a healthy control population, facilitating the estimation of measures of diagnostic accuracy. However, there are methodological details of their study that could offer an alternative perspective to the reported findings, while additional broader issues surrounding feasibility and ethics of using such objective measures in real-world clinical practice warrant mention⁴.

The authors reported a higher duration of phone calls in patients with BD across all mood states, higher number of incoming texts in patients during manic/mixed states and a higher time screen was on in patients during euthymic states compared to controls. The patient population was largely comprised of unemployed students, while the control population was older, and mostly full-time employed individuals. It is not possible to rule out that these findings reflect an artifact

of population differences in lifestyle and employment status, particularly given multivariable models were only adjusted for sex and age. Another pilot study of similar design did not find that duration of calls was associated with BD mood states, and that none of the objective smartphone measures examined predicted mood symptom scores over clinical thresholds⁵. More work is needed to understand the underlying meaning of these passive measures across different groups and whether other objective smartphone measures are more appropriate.

The use of remote time data reflects a unique opportunity to determine changes in activity in weeks, days and possibly hours prior to a BD episode. Faurholt-Jepsen and colleagues mapped average objective measures over the 4-day look back window of forced time clinical assessment scales measured every 2 weeks over 3 months. Clinical assessment measures of current symptoms during a short window limits the ability to detect full diagnostic threshold, naturally occurring episodes. Cohort studies mapping passive behavioural measures prior to, and during clinician confirmed BD episodes could contribute to informing the validity of these measures. Further, the promise of linking large cohorts involving digital real time data, with medical records, a current Medical Research Council funded Mental Health Data Pathfinder initiative (<https://mrc.ukri.org/news/browse/making-best-use-of-big-data/>), reflects a unique opportunity to map these daily measures onto BD episodes captured through primary and secondary care settings, occurring in real time.

Faurholt-Jepsen and colleagues study involved a small, selective sample, albeit it was a pilot study. While highly motivated patients accessing specialist mental health services may be willing to participate in this form of monitoring by researchers/clinicians, the feasibility of this approach at a broader clinical scale is unknown. Further, problems in device compatibility and inconsistent

smartphone usage across individuals poses challenges. The authors encountered this problem, having to exclude iPhone using patients. This begs the question: are there differences between Android and iPhone users, or other phone usage patterns, and what implications does this have for which populations will benefit most from this potential form of patient monitoring?

The ethics surrounding the use of objective smartphone data for patient monitoring are complex. Some of these unique challenges include whether clinicians are adequately educated to promote mobile digital applications; the response by patients to the recommendation of using their passive smartphone data for illness monitoring; and importantly, the ethics of recommending digital applications to patients that could potentially impose inequalities in access, and the ability for commercial organizations to harvest data⁴. Considerable work will be needed to build strong policies and data practice guidelines to ensure the reduction of potential harm to patients and the real possibility of a “patient data market”.

Identifying valid and feasible behavioural markers of risk could contribute to the improvement of early identification in BD, which remains a challenge in clinical practice. The difficulty will be to identify which smartphone passive measures are the correct proxy for behavioural changes relevant to BD. Important questions remain surrounding the feasibility and ethics of using objective smartphone data for this purpose and warrant extensive attention in parallel to research and development.

References

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